

REMARKS

Claims 26-94 and 97-104 are pending. By this Amendment, claims 26 and 38-45 are amended. The attached Appendix includes a marked-up copy of each rewritten claim (37 C.F.R. §1.121(c)(1)(ii)).

I. Information Disclosure Statement

The Examiner is requested to consider the references submitted with the attached Information Disclosure Statement.

II. The Examiner still has not indicated whether the Request to Amend Inventorship has been acted upon

Applicant repeats his request that the Examiner indicate whether the Request to Amend Inventorship has been acted upon. The Request to Amend Inventorship, due to the cancellation of non-elected claims, was filed with the other papers on December 12, 2000. The January 26 and August 9 Office Actions, however, do not reference the Request to Amend Inventorship. The Examiner is requested to confirm that the inventorship has been amended, such that Hiroto HORIKAWA is identified as the sole inventor, in the next Patent Office communication.

III. All Pending Claims are Patentable

Applicant notes with appreciation the allowance of claims 30-37 and the indication that claims 26-29 would be allowable once the rejection thereof under 35 U.S.C. §112 is overcome. See items 11 and 12 on page 7 of the Office Action. (Item 14 on page 7 of the Office Action and the failure to indicate the correct status of these claims on the Office Action Summary (Form PTO-326) appear to be clerical errors on the part of the Patent Office.) Applicant respectfully submits that all pending claims are in condition for allowance.

Claims 26-29 stand rejected under 35 U.S.C. §112, second paragraph. Applicant submits that the above amendment to claim 26 overcomes this rejection, and that claims 26-29 are in condition for allowance.

Claims 54-104 stand rejected under 35 U.S.C. §112, first paragraph. This rejection is respectfully traversed.

The Office Action states:

"Regarding claims 54, 59, 66, 71, 76, 83 and 88, the actuator being driven to prevent a positional error, the actuator with a first portion connected to the first stage and the second portion connected to the second stage are not adequately disclosed."

Applicant respectfully disagrees.

The specification describes the above-noted features of the claims with sufficient detail to enable one having ordinary skill in this art to make and use the invention. With respect to the feature of the actuator being driven to prevent positional error (recited in claims 54, 59, 71, 76, 83 and 88), see, for example, page 25, line 2 - page 26, line 9. With respect to the actuator having first and second portions respectively connected to the first and second stages (recited in claims 66, 71 and 76), see, for example, Figs. 6 and page 24, lines 3-12. For example, actuators 39A and 39B have first portions 38A and 38B attached to stage 9, and second portions 37A and 37B attached to stage 8. Thus, the 35 U.S.C. §112, first paragraph rejection is without merit and should be withdrawn.

Claims 38-45, 54-94 and 97-104 stand rejected under 35 U.S.C. §103(a) over U.S. Patent No. 5,477,304 to Nishi in view of U.S. Patent No. 4,916,340 to Negishi. This rejection is respectfully traversed.

Regarding independent claim 38, neither Nishi nor Negishi discloses or suggests the claimed first electromagnetic actuator combined with the claimed second electromagnetic actuator, along with the claimed first and second thrusts. The Office Action correctly recognizes that the actuators 38, 40, 42 of Nishi are not electromagnetic actuators. The Office Action, however, relies upon Negishi for its electromagnetic actuators. Negishi merely discloses a Y stage 10 moving with respect to the surface plate 15 in the Y direction, and an X stage 11 moving with respect to the Y stage 10 in the X direction. The X stage 11 cannot move with

respect to the Y stage in the Y direction. Therefore, the X stage of Negishi does not correspond to the second stage of claim 38, which moves in two perpendicular directions with respect to the first stage. Accordingly, claim 38 and its dependent claims are patentable over the applied references.

With respect to independent claims 54, 59, 66, 71, 76, 83 and 88, neither Nishi nor Negishi discloses or suggests the combination of features recited in these claims. In particular, the references do not disclose or suggest driving the first actuator to prevent positional error of the mask at least when the second actuator is being at least one of accelerated and decelerated, as recited in claims 54 and 83. The references also do not disclose or suggest driving a second stage to prevent a positional error between the first and second stages when the first stage is being at least one of accelerated and decelerated, as recited in claims 71, 76 and 88. In addition, the references do not disclose or suggest driving a fine adjustment stage to prevent a positional error between the scanning stage and the fine adjustment stage at least when the scanning stage is being one of accelerated and decelerated, as recited in independent claim 59. Furthermore, the references do not disclose the claimed actuator that drives the second stage at least when the first stage is being at least one of accelerated and decelerated as recited in independent claim 66. The Office Action fails to even mention the "at least when...is being at least one of accelerated and decelerated" feature of these claims, and thus appears to overlook this feature of the claims.

Nishi only drives the fine adjustment stage to effect positional correction during the time when the scanning stage is driven at a constant speed (i.e., not when it is accelerating or decelerating). See, e.g., col. 4, lines 45-47 and col. 4, lines 57-58. For example, as described in Nishi, driving of the fine adjustment stage to effect position correction (see col. 12, line 60 - col. 13, line 6) does not occur until after the reticle scanning stage 20 reaches its desired speed (see col. 12, lines 55-59), i.e., when it is not accelerating or decelerating.

Accordingly, Applicant respectfully submits that independent claims 54, 59, 66, 71, 76, 83 and 88, as well as their dependent claims, are patentable over the applied references.

Claims 46-53 stand rejected under 35 U.S.C. §103(a) over U.S. Patent No. 5,477,304 to Nishi in view of U.S. Patent No. 5,623,853 to Novak. This rejection is respectfully traversed.

Independent claim 46 recites that an actuator drives the fine adjustment stage in a scanning direction, that an actuator drives the fine adjustment stage in a direction perpendicular to the scanning direction, and that the cooling unit cools the actuators by circulating a cooling fluid from the actuators arranged in the direction perpendicular to the scanning direction.

Neither Nishi nor Novak discloses or suggests such a direction for circulating the cooling fluid. The Office Action fails to mention, and appears to overlook this "directional" feature of claim 46. In addition, neither reference discloses or suggests providing a cooling unit for the actuators of a fine adjustment stage. Accordingly, Applicant submits that independent claim 46 and its dependent claims are patentable over the references.

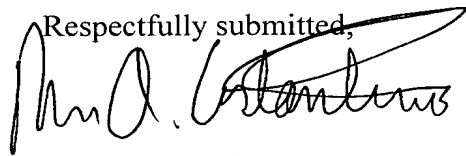
Claims 54-94 and 94 [sic, 97] - 104 stand rejected under 35 U.S.C. §103(a) over U.S. Patent No. 5,699,145 to Makinouchi et al. in view of U.S. Patent No. 4,916,340 to Negishi. This rejection is respectfully traversed.

Like Nishi (and Negishi), Makinouchi et al. does not disclose or suggest the above-noted features of independent claims 54, 59, 66, 71, 76, 83 and 88. The Office Action does not even mention, and thus appears to overlook, the above-noted features of these claims when it makes this rejection. It appears that driving of the Makinouchi et al. fine stage (described, e.g., at col. 11, lines 55-65) does not occur until after the course stage has been accelerated (described at, e.g., col. 11, lines 20-22). Accordingly, Applicant respectfully submits that independent claims 54, 59, 66, 71, 76, 83 and 88, as well as their dependent claims, are patentable over Makinouchi et al. and Negishi.

IV. Conclusion

In view of the foregoing, Applicant respectfully submits that this application is in condition for allowance. Favorable consideration and prompt allowance are earnestly solicited.

Should the Examiner believe anything further would be desirable to place this application in even better condition for allowance, the Examiner is invited to contact Applicant's undersigned attorney at the telephone number listed below.

Respectfully submitted,


James A. Oliff
Registration No. 27,075

Mario A. Costantino
Registration No. 33,565

JAO:MAC/ccs

Attachments:

Appendix
Petition for Extension of Time
Information Disclosure Statement

Date: January 2, 2002

OLIFF & BERRIDGE, PLC
P.O. Box 19928
Alexandria, Virginia 22320
Telephone: (703) 836-6400

DEPOSIT ACCOUNT USE AUTHORIZATION Please grant any extension necessary for entry; Charge any fee due to our Deposit Account No. 15-0461
--

APPENDIX

Changes to Claims:

The following are marked-up versions of the amended claims:

26. (Twice Amended) A stage apparatus for scanning an object that includes at least one of a mask and a photosensitive substrate, said stage apparatus being provided to a scanning exposure apparatus that illuminates said mask on which a transfer pattern is formed and scans said mask in a predetermined scanning direction and synchronously scans said substrate in a direction corresponding to said scanning direction, thereby exposing said pattern on said mask onto said substrate, comprising:

a base;

a scanning stage that is movable in said scanning direction on said base;

a fine adjustment stage that is movable within predetermined ranges in said scanning direction and in a direction perpendicular to said scanning direction with respect to said scanning stage, said fine adjustment stage mounting said object thereon, said fine adjustment stage having a movable mirror;

actuators arranged in said scanning direction and in the direction perpendicular to said scanning direction with respect to said scanning stage for driving said fine adjustment stage;

an interferometer that irradiates a measurement light beam on said movable mirror to detect a displacement of said fine adjustment stage with respect to said scanning stage; and

a cooling unit that cools said actuators by circulating a predetermined cooling fluid, said cooling unit circulating said cooling fluid from a portion near an optical path of the light beam from said interferometer toward a distant portion the actuators.

38. (Twice Amended) A stage apparatus comprising:

a first stage that is movable linearly in a first direction;

a second stage that is movable in said first direction and in a second direction perpendicular to said first direction with respect to said first stage;

a first electromagnetic actuator ~~having a first linear motor to drive~~ that drives said second stage with a second thrust in said second direction with respect to said first stage;

and

a second electromagnetic actuator ~~having a second linear motor that is different from said first electromagnetic actuator~~ to drive said second stage with a first thrust in said first direction with respect to said first stage, said first thrust being different from said second thrust.

39. (Twice Amended) An apparatus according to claim 38, wherein said first electromagnetic actuator is ~~an electromagnetic actuator of a moving magnet type~~, and a first coil member of said first electromagnetic actuator is fixed to said first stage.

40. (Twice Amended) An apparatus according to claim 38, wherein said second electromagnetic actuator is ~~an electromagnetic actuator of a moving magnet type~~, and a second coil member of said second electromagnetic actuator is fixed to said first stage.

41. (Twice Amended) An apparatus according to claim 39, further comprising a cooling unit that cools said first coil member of said first electromagnetic actuator by circulating a cooling fluid.

42. (Twice Amended) An apparatus according to claim 40, further comprising a cooling unit that cools said second coil member of said second electromagnetic actuator by circulating a cooling fluid.

43. (Amended) An apparatus according to claim 41, wherein said second stage has a movable mirror; and further comprising:

an interferometer that irradiates a measurement light beam on said movable mirror to detect a displacement of said second stage with respect to said first stage; and

wherein said cooling unit circulates said cooling fluid from a portion near an optical path of the light beam from said interferometer toward a ~~distant portion~~ said first coil member.

44. (Amended) An apparatus according to claim 42, wherein said second stage has a movable mirror; and further comprising:

an interferometer that irradiates a measurement light beam on said movable mirror to detect a displacement of said second stage with respect to said first stage; and

wherein said cooling unit circulates said cooling fluid from a portion near an optical path of the light beam from said interferometer toward a ~~distant portion~~ said second coil member.

45. (Twice Amended) An apparatus according to claim 38, wherein at least one of said first and second electromagnetic actuators is constituted by a pair of subactuators which are parallelly arranged.